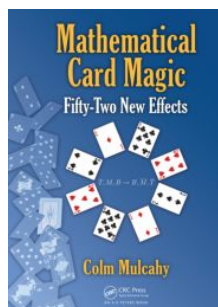


Mathematical Card Magic: Fifty-Two New Effects, 2013, A K Peters/CRC Press, ISBN 978-14-6650-976-4 (hbk), xxv+354 pp. by *Colm Mulcahy*.



Colm Mulcahy

Colm Mulcahy has Irish roots, with a MSc from the University College Dublin, but he got a PhD from Cornell, and he is teaching at the Math Department of Spelman College, Atlanta (GA) since 1988. He regularly contributes a math column to The Huffington Post, but he is foremost an enthusiastic user of internet media. He has a *Math Colm*¹ blog, and on his *Card Colm*² website he has many interesting links, for example to material related to his much admired hero Martin Gardner, but most of all to the items of his bimonthly *Card Colm blog*³, that is sponsored by the MAA. In the latter he discusses mathematically based ‘effect’ (he avoids using the word ‘tricks’ for some reason) you may obtain by manipulating a card deck. His website has extra videos illustrating the manipulation of the cards, and of course a link to the book under review. This book is the eventual realization of a suggestion made to him by Martin Gardner, many years ago.

So here it is: a book presenting 52 effects arranged in 13 chapters, with 4 sections each, a numerological predestination for a book about card tricks. The actual contents is however a bit liberal with these numbers. There is for example an unnumbered introduction that serves as an appetizer but also introduces some terminology and card shuffling techniques, and there is a coda that gives some additional information. Also each chapter may have the four ‘effects’, but they often consist of several introductory sections as well. The effects get some inspiring names like *Full House Blues*, *Easy as Pi*, or *Twisting the Knight Away* etc. The effects are usually introduced in several steps: *How it looks* is just describing what an uninformed observer will experience, then *How it works* says what the mathemagician is actually doing, and in *Why it works* it is explained in more detail what is going on. This is often followed with different options on how to present the magic to the public. Also the origin of the method is referred to, which, no wonder, is often one of his Card Colms blogs. The chapters end with some *Parting Thoughts* which are further elaborations of the previously introduced principles, sometimes in the form of exercises: ‘prove that...’, ‘what if...’, ‘how to...’.

Mulcahy also gives his effects some Michelin-like ratings in the margins. It can have one ♣ (easy) up to four ♣♣♣♣ (difficult) clubs for mathematical sophistication, similarly hearts ♥ grade entertaining value, spades ♠ are used to rate the preparatory work needed, and diamonds ♦ refers to the concentration and counting that is needed during the performance.

The effects are based on underlying mathematical principles. There are many of them, and most are believed to be original in their application to card magic. Since these principles are introduced but also re-used at several instances, they get some mnemotechnic names. Some recurrent ones are the COAT (Count Out And Transfer) and TACO which is some kind of inverse, not to be confused with a CATO (Cut And Turn Over). These give rise to neologisms like ‘minimal underCOATing’ of ‘Fibbing’ when it concerns Fibonacci numbers. TOFUH stands for Turn Over And Flip Under Half, sounds healthier than the alternative FAT (Flip And Transfer). In many cases, the order of the suits is important. So the deck can be in cyclic CHaSeD (Clubs, Hearts, Spades, Diamonds) order, and there are many more like this. These witty namings and word plays make the text fun to read.

Since Mulcahy stresses at many places that the mathemagician should not reveal the mathematics behind the magic, I will not uncover them either except for a simple example of the kind

¹aperiodical.com/category/columns/maths-colm/

²cardcolm.org/

³cardcolm-maa.blogspot.be

of mathematics involved at the end of this review. As he writes: The best answer to the question ‘How did you do that?’ is to say ‘Reasonably well, I think’. Unless the audience is really interested in the mathematics, it is unwise to explain what is going on. Otherwise comments like ‘So is this all you did? It is just mathematics?’, will kill all the magic. It is absolutely rewarding however to convince young people that mathematics is everywhere and can be fun to play with. So it is perfectly all right if a teacher explains the mathematics to his pupils.

In most cases, the mathematics are not that advanced. Just counting will do. Not plain combinatorics or modulo calculus though (a terminology not used by Mulcahy). The fact that there are 13 different faces and 4 different suits makes the counting special. Fibonacci numbers can play a role, for example when the sum of two sequential cards in a deck forms a Fibonacci sequence, then the mathemagician can name the cards if the sum is called out. Occasionally some probability is involved. As one reads along, the effects become more involved, hence more complicated to perform, but they will have a higher magical alloy and thus be more rewarding. Some involve an accomplice to assist the magician.

One word about the typography. The numbering of the chapters is with cards (A for the first, 2 for the second,..., K for the 13th) and the effects within the chapters are numbered like $6\clubsuit$ for the first one in chapter 6, or $K\spadesuit$ for the third one in chapter 13 (CHaSeD order). Printed on glossy paper with many colour illustrations, it is not only fun, but also a pleasure to read. The apprentice magician will have a lot to practice on but even the professional magician will find many things to think about while mastering this wonderful calculus of the card deck.



when $k = 5$ (underCOAT) or $k = 10$ (overCOAT), i.e., when it does not satisfy the preset bounds. Of course the magical effect will only work if this is not known to the public and if a proper show-element is added, by letting the spectators shuffle the cards, peek at the bottom card, and letting them choose for example their favorite ice cream flavor and dealing the k cards by counting the letters in the word ‘chocolate’ if that happened to be their choice.

Here is an illustration of what such an effect may look like. In his Card Colm of April 30, 2013, (and in chapter $A♥$ of the book) Mulcahy explains the ‘Low-Down Triple and Quadruple Dealing’ effect. The magician deals k cards from the top (hence reverting order). If there are n cards in the deck, then k has to satisfy $n/2 < k \leq n$. Then he drop the rest of the deck on top of them. This is just a simple COAT. The effect is obtained by triple COATing, i.e., repeat the COAT two more times. The result will be inevitably that the card originally at the bottom will end up at the top as seen in the illustration. An example. Take $n = 13$ cards, which for illustrative reasons are ordered as $A♥, \dots, K♥$, and we are looking at them face-up, which is not what the spectators see. They are looking at a face-down deck. The pictures show the initial stage with the $K♥$ at the bottom and $A♥$ on top. After a ‘Low-Down Triple Dealing’ with $k = 9$, $K♥$ will be at the top of the deck. What will happen after one more COAT?. What happens

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